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Public opinion on climate change: belief and concern, issue salience and support for government action

Sam Crawley, Hilde Coffé and Ralph Chapman

Climate policy across the developed world remains inadequate, despite high levels of concern about climate change among the public. Yet public opinion on climate change is complex, with individuals differing on three key opinion dimensions: belief and concern, issue salience, and support for government action. In this study, we investigate how these dimensions intersect at the individual level. Based on data from an online survey conducted in 2018 in the United Kingdom (N = 787), a latent class analysis reveals that there are five climate change opinion publics. The two largest publics have strong beliefs that climate change is occurring, but view it as a low salience issue, or are wary of government action to address it. We also investigate sociopolitical covariates of each public. By providing a detailed picture of climate change views, these findings can help us to better understand the relationship between public opinion and climate policy.

Keywords: climate change, public opinion, United Kingdom, issue salience

Introduction

While climate change is a problem that requires immediate and substantial action, to date, pledges from national governments to reduce emissions have been inadequate. Almost none of the countries party to the Paris agreement are on track to keep emissions to a level compatible with the goal of remaining well under the maximum of 2°C of warming by the end of the 21st century. While a variety of factors may account for this lack of action, in liberal democracies, the views of the public often play a role in determining the policies that governments select (Burstein, 2003; Shapiro, 2011; Soroka and Wlezien, 2004), and previous research suggests that there is a link between public opinion and climate policy (Tjernström and Tietenberg, 2008; Vandeweerd et al., 2016). It is important, then, to properly understand the nature of the public's views on climate change.

Previous studies have examined a range of dimensions of climate change opinion, including the belief that climate change is occurring, degree of concern about

climate change, and the salience of the issue (e.g. Egan and Mullin, 2017; Lewis et al., 2018; McCright and Dunlap, 2011; Scruggs and Benegal, 2012). Typically, however, these dimensions are analysed separately, and the focus is often primarily on people's degree of belief or concern about climate change, or the extent to which people deny that climate change is occurring. A handful of studies have examined how multiple dimensions of climate change opinion interact at the individual-level (Leiserowitz et al., 2009; Maibach et al., 2011; Metag et al., 2017), although they do not include the dimension of issue salience.

Relying on an original online survey conducted in the UK in August 2018, the current study investigates three dimensions of climate change opinion. In contrast to previous studies investigating multiple dimensions of climate change opinion, we examine not only belief in and concern about climate change, but also issue salience and support for government action on climate change. Issue salience can account for the differences in resolve to address climate change among those who believe that climate change is happening (Bromley-Trujillo et al., 2014). Moreover, issue salience is likely to be critical in determining whether public opinion influences policy (Burstein, 2003), as it is a clear signal from the public on whether more needs to be done by the government (Soroka and Wlezien, 2004). Investigating these three dimensions, therefore, can help to create a clearer picture of the relationship between climate change views and climate policy than considering belief in climate change alone (Bromley-Trujillo et al., 2014; Burstein, 2003; Hagen et al., 2016). We address two research questions in this study. First (descriptive), how do the three dimensions intersect at the individual level to form different 'publics' of climate change views? Second (explanatory), to what extent do sociopolitical characteristics relate to membership of these publics?

Theory

The dimensions of climate change opinion

Research suggests that large majorities in most countries believe that climate change is occurring, and are concerned about it (Tranter and Booth, 2015). It could be inferred from these findings that policy-makers – who have so far failed to address climate change adequately – are ignoring public opinion by not adopting stronger climate policies. However, few of those who accept the science of climate change see it as a high

salience issue, or support government action to address it (Bromley-Trujillo et al., 2014; Kotchen et al., 2017). Therefore, any hesitancy by climate policy-makers to adopt a more comprehensive policy programme may be due not to the public's denial of climate change, but to the fact that the public views climate change as a low salience issue and are concerned about the consequences of government policy action.

Given the multi-dimensional nature of climate change views, it is important to ensure that all relevant aspects are accounted for when analysing opinion on climate change. One tool to assist with identifying these relevant aspects is the concept of 'public will'. As Raile et al. (2014: 105) explain, public will is 'a social system's shared recognition of a particular problem and resolve to address the situation in a particular way through sustained collective action. Central to this definition are the ideas that many different "publics" can exist at any given time and that a public need not represent a majority of the population to be meaningful.' Public will has two important implications for the current study. First, society comprises multiple publics with respect to particular issues, each with distinct views of an issue, which may not fit along a single dimension. Identifying and characterising each public with respect to these dimensions can allow us to get a better understanding of climate change opinion in the context of its possible effect on policy.

Second, the concept of public will can be used to select the relevant dimensions of climate change opinion that define the different publics. A 'shared recognition of the problem' can be determined by investigating citizens' belief in climate change and its causes, the certainty with which those views are held, and the degree of concern about the problem. Issue salience can be used to understand a public's degree of 'resolve to address the issue'. Finally, the 'particular way' in which each public believes the problem should be solved is interpreted here as the extent to which individuals believe government policy (as opposed to voluntary action by individuals and businesses) should be used to mitigate emissions.

These dimensions of climate change opinion (belief and concern, salience, and support for government action) have been examined in previous studies, although most studies focus on one of the three dimensions (rather than combining them). Of the three, the belief and concern dimension has received by far the most attention (Knight, 2016; Nisbet and Myers, 2007; Pew Research Center, 2015; Scruggs and Benegal, 2012), with research on belief often focussing on denial or scepticism (McCright and Dunlap,

2011; Poortinga et al., 2011; Tranter and Booth, 2015). Less attention has been paid to issue salience, even though it is generally agreed to be important for understanding climate change views because climate change appears to be of very low salience for much of the population (Bromley-Trujillo et al., 2014; Herrnsstadt and Muehlegger, 2014). Some previous research has examined support for government action to address climate change, often by examining the extent to which people are willing to pay higher taxes to address climate change, or whether they support or oppose particular policies (Kotchen et al., 2017; Maibach et al., 2011; McCright et al., 2013).

In adopting the concept of public will, this study takes a ‘person-centred’ approach to investigate climate change opinion, rather than the ‘variable-centred’ approach typically used in quantitative social science research (Laursen and Hoff, 2006; Magnusson, 2003). A person-centred approach seeks to identify groups of individuals within a population that have similarities with respect to the specific measures under investigation (Laursen and Hoff, 2006). Such an approach offers two main advantages for the purposes of our study. First, identifying groups within a population fits well with the concept of public will, which suggests the existence of multiple publics. Second, a person-centred approach accounts for the various positions an individual may take on the three dimensions we investigate. For example, although many people may believe that climate change is happening, some see it as a high salience issue, whereas others only see it as medium or low salience. Two groups could thus be identified among those who believe in climate change: one where members believe in climate change and see it as high salience, and another where members also believe in climate change, but see it as medium or low salience. These two groups may have differences between them with respect to other measures of climate change opinion (for example, the extent to which they support the government taking action), and to predictors of group membership (such as demographic variables). Taking a person-centred approach, then, means that the opinions of the various groups within the population can be understood with greater clarity than if only a variable-centred approach was used, where the relationships between measures such as belief and salience can only be understood at the aggregate level (Laursen and Hoff, 2006).

Previous research has used person-centred techniques to investigate climate change opinion, dividing individuals into ‘audience segments’. Using a latent class analysis of survey data, Leiserowitz et al. (2009) identify six segments of the American

public with various attitudes to climate change ranging from ‘alarmed’ to ‘dismissive’ (see also: Metag et al., 2017; Morrison et al., 2013). Importantly, however, these studies have mainly aimed at understanding how best to communicate with the different groups (hence the use of language such as ‘audience segments’) (Maibach et al., 2011). Additionally, the standard survey tools employed by these studies do not include questions on issue salience (Maibach et al., 2011). Yet, politicians are more likely to respond to public opinion if most people are not only concerned about climate change but also see it as highly salient (Burstein, 2003; Raile et al., 2014). Therefore, including issue salience in a person-centred analysis can lead to an improved understanding of how public opinion relates to policy, as it allows differentiation between people who are concerned, but see climate change as either a low or high salience issue.

To form expectations about which publics we might find in the population, we examined the different possible combinations of positions on the three key dimensions: belief and concern, salience, and support for government action. These positions suggest four possible climate change publics, as summarised in table 1: the highly engaged, the moderately engaged, the non-interventionists and the deniers. While other combinations may also be possible (for instance, someone could support government action, despite not being concerned about climate change, or seeing it as high salience), these four outlooks are likely to be large enough to warrant investigation, based on previous research (e.g. Egan and Mullin, 2017; Leiserowitz et al., 2009; Tranter and Booth, 2015).

Table 1 - Summary of possible climate change publics

	Strong belief in and concern about climate change?	See issue as high salience?	Supports government action?
Highly engaged	Yes	Yes	Yes
Moderately engaged	Yes	No	Yes
Non-interventionists	Yes	Yes/No	No
Deniers	No	No	No

In most countries, a committed group of citizens are deeply concerned about climate change, strongly support government action to address it, and – we anticipate – see climate change as a high salience issue (Leiserowitz et al., 2009). We refer to this public

as the ‘highly engaged’. Although most countries have a high proportion of highly concerned citizens, on average, climate change is rated as low salience (Bromley-Trujillo et al., 2014; Egan and Mullin, 2017). We thus expect a large group of citizens to form the ‘moderately engaged’ public, whose members have high levels of belief that climate change is occurring, and would like the government to act on it, but tend to believe that other issues are more salient. Given that some citizens may be ideologically opposed to strong government regulations or economic intervention, we also expect there will be a ‘non-interventionist’ public, which has high levels of belief that climate change is happening, may or may not view it as highly salient, but does not support strong government action on climate change (Drews and van den Bergh, 2016). Many studies have confirmed that sections of the population in most countries do not believe climate change is happening, or is a serious threat (Tranter and Booth, 2015). We thus anticipate a ‘denier’ public to have strong beliefs that climate change does not exist, or that it is not a serious threat, and therefore will not see climate change as high salience, or support government action to address it.

Additionally, some individuals will not fit into any of these categories, such as those who are uncertain or ambivalent about climate change. We refer to this group as the ‘uncertain’. Their positions on the three main dimensions are more difficult to establish from the existing literature. However, previous research has indicated a substantial proportion of the public are uncertain about whether climate change is occurring, and what should be done about it (Hagen et al., 2016; Poortinga et al., 2011). A person-centred approach can identify whether or not the uncertain is a genuine ‘public’, or merely a catch-all for individuals who do not fit into the other publics. Consistent climate change views among members of the uncertain group (for instance, having similar ideas about the seriousness of climate change), and similarities in the sociopolitical profile of members of the uncertain group would both be indications that the group is a genuine, separate public. As uncertainty about climate change has previously been found to be common, we expect individuals forming the uncertain group to have consistent views on many aspects of climate change, and that our analysis will help to more clearly define what these views are.

Climate change opinion in the UK

Turning to the specific case investigated in this study, the UK is a country which has been at the forefront of climate change policy. In 2008, the UK passed the Climate

Change Act 2008, which has been seen as one of the most innovative and comprehensive pieces of climate change legislation adopted at the national level (Fankhauser et al., 2018). Existing research shows that public opinion about climate change is similar in the UK to most other developed countries. In particular, most people in the UK are concerned about climate change, with a 2015 Pew Research Center poll reporting that 77% of people in the UK believe that climate change is a very or somewhat serious problem (Pew Research Center, 2015). Absolute denial or scepticism about climate change is relatively rare in the UK, although some studies have found that many people are uncertain about whether or not climate change is happening (Poortinga et al., 2011; Taylor, Dessai, et al., 2014; Whitmarsh, 2011). These levels of concern and denial appear to be relatively stable over time.

Despite the reasonably strong belief and concern about climate change in the UK, salience of the issue is low (Lorenzoni and Pidgeon, 2006). For example, a 2016 study found that only two percent of respondents in the UK said 'climate change' was the most important issue facing the country (in response to an open-ended question) (Steentjes et al., 2017). People tend to be more worried about issues such as the economy, healthcare and immigration instead (Steentjes et al., 2017). Even when compared with other environmental issues, climate change tends to receive a low ranking (Nisbet and Myers, 2007).

There is a reasonable degree of support in the UK for government policy to address climate change (Rietig and Laing, 2017), although support is typically for policies that would not result in higher prices being passed on to consumers (Kantenbacher et al., 2018). The British public tends to believe responsibility for action on climate change rests primarily with national governments, international organisations, and businesses rather than with individuals (Pidgeon, 2012; Spence et al., 2010).

To summarise the expectations relating to the first research question, we expect each of the four publics to be found in the UK, given that UK opinion on climate change is fairly similar to that in other developed countries. In addition, we expect a fifth group (the uncertain) to consist of a collection of views that do not fit into the four main publics.

Sociopolitical characteristics of the publics

Investigating climate change opinion using a person-centred approach allows for analysis of the sociopolitical profile of each of the publics, which is the second research question addressed in this study. Previous research conducted in developed countries has investigated the sociopolitical characteristics of people with particular climate change views, finding that age, political orientation, education level, and socioeconomic status often relate to people's outlook on climate change (Knight, 2016; McCright and Dunlap, 2011; Poortinga et al., 2011; Tranter and Booth, 2015; van der Linden, 2017). Given that the relationship between sociopolitical characteristics and climate change views can vary across countries (Poortinga et al., 2019; Tranter and Booth, 2015), it is important to consider the specific context of the UK.

In the UK, older people with below average income are more likely to be sceptical of climate change (Capstick and Pidgeon, 2014; Clements, 2012; Poortinga et al., 2011). Previous research has also revealed that those with lower levels of education are more likely to be sceptical about climate change (Capstick and Pidgeon, 2014; Clements, 2012), and there is some evidence that men are also more likely to be deniers (Clements, 2012). Few studies have examined the differences in climate change views in the UK among different ethnicities, although Clements (2012) finds some evidence that those who identify as white are more likely to be supportive of tackling climate change.

The theoretical explanations for why such demographic characteristics relate to climate change views are, however, rarely considered (van der Linden, 2017). One plausible explanation is that post-material values, often found to be positively correlated to belief in climate change (Kvaloy et al., 2012; Mostafa, 2016), are also associated with being younger and on a higher income (Moors, 2003). Gender differences can be explained by women tending to be socialised to have higher levels of empathy than men, leading them to hold stronger pro-environmental attitudes (Milfont and Sibley, 2016). Several studies have suggested that the effect of education on climate change views does not come from the inability of those with less education to understand the science of climate change, but is instead related to the political orientation of the highly educated (Hamilton, 2011; Hamilton et al., 2015; Kahan et al., 2012). In other words, it seems that the highly educated are more able than those with less education to receive political cues on climate change, and engage in motivated reasoning that aligns with their existing ideology (Hamilton et al., 2015; Kahan, 2015).

Overall, demographic differences in climate change views seem to be related to differences in political and environmental values (Dietz et al., 2005).

Unlike the US, views on climate change in the UK do not seem to be starkly politically polarised. While there is evidence that Labour voters tend to believe climate change is a more serious problem than Conservatives, it is a much smaller gap than that between Republican and Democrat supporters in the US (Pew Research Center, 2015). Clements (2012) finds that those on the right in the UK are more likely to be sceptical about climate change. Political orientation may be connected to climate change views through motivated reasoning, where individuals evaluate information about a topic based on their existing ideological precepts, rather than on its objective truth (Kahan, 2015, 2016). Alternatively, people may simply dismiss information sources as not credible if the information provided by the sources does not conform to their existing beliefs or ideology (Druckman and McGrath, 2019).

We have clear expectations, then, about the sociopolitical characteristics of the highly engaged and denier publics. In particular, we expect members of the former to be typically younger, more left-leaning, more highly educated and with a higher than average income, while the denier public will be older, more right-leaning, less highly educated, and with a lower than average income. Given the lack of existing research on the other publics, developing expectations about their sociopolitical characteristics is more challenging. Overall, we expect the moderately engaged to be similar to the highly engaged, and the non-interventionists and uncertain to be similar to the deniers.

Data and Method

To gain a better understanding of the dimensions of climate change opinion, we conducted an original online survey in the UK. Respondents were recruited through the online platform 'Prolific', a UK-based service where individuals can sign up to participate in surveys, receiving a small payment in return. Researchers post the details of their survey, including any pre-screening criteria, and the Prolific system emails eligible participants. Prolific is similar to Amazon MTurk (a platform that has been used for a number of studies (Buhrmester et al., 2011)); however, Prolific is designed specifically for surveys, and caters more to academic researchers (Peer et al., 2017). While previous research has shown that social science studies conducted using Prolific have similar results to those conducted using more traditional respondent pools (Palan

and Schitter, 2017; Peer et al., 2017), we applied weightings (based on gender, age, education and ethnicity) to the responses to reduce some of the sample's bias.¹

The survey comprised questions (many of which were based on those used by Maibach et al. (2011)) on the three dimensions of climate change investigated in this study: belief in and concern about climate change, issue salience, and support for government action. Additionally, respondents were asked about their sociopolitical characteristics, including age, gender, education, income, political orientation, and party preference. A detailed description of the variables can be found in section 1 of the supplemental material. Two variables warrant explanation here: belief in climate change and issue salience. The belief measure is derived from two survey questions, the first asking 'Do you think that climate change is happening?' (with responses being 'yes', 'no' or 'don't know'), and the second asking 'How certain are you that climate change is/isn't happening?', with responses on a five point scale, ranging from 'not at all certain' to 'extremely certain'. The belief variable was coded by assigning 1 to those who are extremely or very certain climate change is not happening, and 7 to those who are extremely or very certain climate change is happening, with remaining responses placed accordingly along the scale. Second, salience – which we define as the perceived importance of an issue for the country relative to other issues – was measured by asking participants to rank eight issues from the most to least important to the country. The salience variable is coded as the ranking each participant gave to climate change, with 1 indicating that the participant sees climate change as the most important of the eight issues, and 8 indicating the participant sees it as the least important.

The survey was conducted in late August 2018, at the end of the hottest British summer on record (BBC, 2018). Previous research has shown that people tend to become more concerned about climate change after experiencing unusual weather patterns (Taylor, Bruine de Bruin, et al., 2014), an effect which tends to be particularly strong for recent weather events. It is likely, then, that more people in the UK were concerned about climate change at the time of the survey than if there had been a more

¹ A more detailed discussion of the method employed, including data collection, application of weights and the list of variables can be found in section 1 of the supplemental material. Descriptive statistics and the text of the survey are presented in sections 2 and 6 of the supplemental material, respectively. The results of the latent class and multinomial regression analyses presented below were roughly the same whether or not weightings were used.

historically typical summer. Respondents were all British citizens, aged 18 and over and currently resident in the UK. 820 people completed the survey. After respondents were removed for not being resident in the UK, missing data or failing two attention checks, 787 respondents were included in our final sample.² To ensure that answers to the salience question were not affected by priming, the initial purpose of the survey was withheld from respondents, and the survey was instead advertised as being about ‘important political issues’. After survey responses were submitted, a debrief message was displayed to respondents explaining the true purpose of the survey.

The data were analysed using a latent class analysis with Mplus 8.2. Two separate analyses were conducted. In the first analysis, addressing the first research question, a measurement model was selected by investigating models with different numbers of classes, and reviewing the fit statistics and substantive interpretation to select the appropriate model. In the second analysis, addressing the second research question, sociopolitical covariates were introduced. This was done using the ‘three-step’ method, where the covariates are regressed on a manifest class variable, which also takes into account the uncertainty of classification for individuals (Asparouhov and Muthén, 2014). For the second analysis, observations with missing values for the independent variables were dropped, meaning 740 observations were included.

Results

Latent Class Analysis

We conducted a latent class analysis using the indicator variables. Models allowing for between one and eight classes were investigated. The runs for models consisting of six, seven and eight classes did not produce duplicated log-likelihood values, and therefore were considered not well-identified. Fit statistics are presented for the remaining models in table 2.

² The first attention check began by mentioning climate change and the news, but then requested that respondents select the ‘Not at all interested’ option. The second attention check was a question about a short article on climate change and policy respondents were asked to read. The question asked respondents to select one of four statements that summarised the text they had read. The text, and associated questions, were part of an experiment, the results of which are not included in this paper.

Table 2 - Model fit statistics

Classes	Parameters	LL	BIC	SABIC	CAIC	AWE	BF	Entropy
1	54	-12681.15	25722.39	25550.91	25776.39	25803.39	1121.06	-
2	109	-11376.72	23480.28	23134.15	23589.28	23643.78	335.67	0.902
3	164	-10857.67	22808.94	22288.15	22972.94	23054.94	2.90	0.91
4	219	-10671.40	22803.13	22107.69	23022.13	23131.63	-46.86	0.898
5	274	-10534.88	22896.85	22026.76	23170.85	23307.85	-	0.871

Note:

LL = log-likelihood; BIC = Bayesian Information Criterion; SABIC = Sample-size adjusted BIC; CAIC = Consistent Akaike Information Criterion; AWE = Approximate Weight of Evidence Criterion; BF = Bayes Factor; Bolded values indicate "best" fit for each respective statistic. Models for 6, 7 and 8 class solutions were also run, but are not displayed here as they were not well identified.

These statistics indicate that the three, four or five class models all have a good fit for the data. Although the CAIC and AWE statistics point to a three class model, and the BIC statistic points to a four class model, for substantive reasons we selected the five class model as the preferred model. In the three and four class models, the classes were harder to interpret. For instance, the class that could be labelled the 'highly engaged' in the three and four class models had higher response probabilities for the lower salience categories than in the five class model. Additionally, those who are uncertain tended to be spread across the classes. There are sufficient differences between the moderately engaged and non-interventionist publics to aid in substantive interpretation of the data. Moreover, these two classes have different sociopolitical profiles (see below).³

Table 3 displays a summary of the results of the latent class model as well as the class labels that were assigned to each of the classes.⁴ Four of the five classes fit well with the publics (and the uncertain group) that had been derived from the literature (see table 1). However, the fifth (the non-interventionists) differed from our expectations. Although members of this public are less willing to pay higher taxes to

³ Local independence checks for the five class model showed some pairs of indicators had significant bivariate residuals (Asparouhov and Muthén, 2015). We therefore investigated alternative models which included residual covariances. These models produced similar results to the initial five class model. We therefore selected the initial five class model on the basis that it was the most parsimonious.

⁴ The full results of the latent class analysis can be found in section 3 of the supplemental material.

address climate change, the model predicts that members of this public have a 0.57 probability of believing that the government is not doing enough to address climate change. For this reason, we relabelled the non-interventionists as the ‘action-wary’.

Table 3 - Summary of latent classes

Variable	Scale	Mean or Probability (Standard Error In Brackets)				
		Highly Engaged	Moderately Engaged	Action-wary	Uncertain	Deniers
Latent class prevalence	-	0.170 (0.058)	0.293 (0.054)	0.328 (0.032)	0.147 (0.022)	0.062 (0.014)
Relative salience of climate change	1-8	3.473 (0.376)	5.284 (0.426)	6.956 (0.172)	7.426 (0.134)	7.239 (0.329)
Belief in climate change	1-7	7.000 (0.000)	6.898 (0.033)	6.498 (0.133)	5.260 (0.235)	2.757 (1.472)
Human causation (probability)	-	0.947 (0.055)	0.890 (0.036)	0.740 (0.049)	0.384 (0.071)	0.036 (0.036)
Scientific consensus (probability)	-	0.954 (0.034)	0.813 (0.044)	0.716 (0.042)	0.585 (0.074)	0.203 (0.122)
Climate change harming people now (probability)	-	0.788 (0.052)	0.654 (0.049)	0.244 (0.055)	0.052 (0.037)	0.053 (0.060)
Seriousness	1-5	4.959 (0.029)	4.528 (0.141)	3.896 (0.081)	2.812 (0.101)	1.718 (0.187)
Personal importance	1-5	4.721 (0.213)	3.896 (0.103)	2.957 (0.073)	1.798 (0.156)	1.251 (0.087)
How informed respondent feels about climate change	1-5	3.717 (0.197)	2.982 (0.091)	2.509 (0.067)	2.125 (0.116)	2.679 (0.197)
Government priority of climate change	1-4	3.488 (0.113)	2.863 (0.155)	2.114 (0.053)	1.492 (0.099)	1.000 (0.000)
Importance of jobs and prices for policy	1-5	3.191 (0.124)	3.386 (0.125)	3.128 (0.077)	2.717 (0.167)	2.443 (0.258)
Government policy preferred to finding own solutions (probability)	-	0.970 (0.018)	0.903 (0.032)	0.771 (0.037)	0.594 (0.069)	0.158 (0.100)
Willingness to pay higher taxes	1-5	4.043 (0.241)	3.179 (0.121)	2.532 (0.115)	1.716 (0.107)	1.071 (0.056)
Government is not doing enough (probability)	-	0.957 (0.038)	0.786 (0.068)	0.567 (0.045)	0.242 (0.069)	0.000 (0.000)

Note:

Means calculated from values estimated by latent class model

The highly engaged public has a prevalence of 0.17. All members of this public have a very strong belief that climate change is occurring, and typically rank climate change as one of the three most important issues. They are also very likely to believe that climate change is an extremely serious problem, is caused by humans and that there is scientific consensus on climate change. Although the highly engaged feel the

most informed of the five publics, many members of this public still feel unsure about their own knowledge of climate change, with a mean score of 3.7 (on a five point scale) in response to the question about how informed they feel about climate change. Not surprisingly, the highly engaged feel that the government is not doing enough about climate change, that climate change should be a very high priority for the government, and is best addressed by government policy.

The moderately engaged public is the second largest of the five publics, with a prevalence of 0.29. Like the highly engaged, they have a very strong belief that climate change is occurring, and are certain in that belief, having a mean score on the seven point belief scale of 6.9, just below the highly engaged. However, the moderately engaged tend to rank climate change as only a medium or low priority compared with other issues. In other respects, they are quite similar to highly engaged citizens, being confident about the scientific consensus, human causes and extremely serious nature of climate change. The moderately engaged are less willing than the highly engaged to pay much higher taxes to address climate change, and believe that climate change should be only a high (as opposed to very high) priority for the government.

The action-wary public is the largest group, having a prevalence of 0.33. They have a high level of belief that climate change is occurring, only slightly below the moderately and highly engaged. However, they see climate change as a very low salience issue, having a 0.73 probability of ranking climate change as either the seventh or eighth most important out of the eight issues. They are reasonably confident that climate change is caused by humans, and that scientists agree on climate change, but are relatively unlikely to believe climate change is affecting people now. With respect to government action, the action-wary tend to believe the government is not doing enough to address climate change, having a 0.57 probability of providing this response. However, they believe that climate change should be only a medium priority for the government, and most are unwilling to pay higher taxes to address climate change.

The uncertain (prevalence 0.15) believe, on average, that climate change is occurring, but are not certain about their beliefs. They view climate change as having very low salience, giving it a mean ranking of 7.43 out of the eight issues. The uncertain are very unlikely to believe climate change is harming people now, although they see it as a moderately serious problem. They feel the least informed of the five publics, having a probability of 0.72 of feeling slightly or not at all informed about climate change. For

the questions asking when people will be harmed by climate change and how the government is performing on climate change, members of the uncertain public are more likely to answer 'don't know' than to provide any other response.

Finally, the deniers are the smallest public, having a prevalence of 0.06. Most deniers do not believe that climate change is happening, although they are not overly confident in this belief, having only a 0.29 probability of being extremely or fairly certain that climate change is not happening. They believe that climate change is a low salience issue, with their mean ranking being slightly less than that of the uncertain. Deniers do not attribute climate change to humans, and do not believe that scientists agree about climate change. Most deniers believe that climate change should be a low priority for the government, and that businesses and individuals should find their own solutions to climate change.

Sociopolitical Covariates

Turning to our explanatory research question, we conducted a multinomial logistic regression of the sociopolitical covariates on latent class membership. Below, we present predicted probabilities plots for the five variables that appeared to have statistically significant relationships with the probability that an individual is a member of a public: age, political orientation, income, education and gender.⁵ The other variables we investigated (ethnicity and party preference) do not seem to have a clear relationship with latent class membership. A table presenting the regression results can be found in section 4 of the supplemental material. The dashed line in each figure below indicates the overall probability of membership of each latent class.

As illustrated in figure 1, age has a moderate effect on membership of the highly and moderately engaged, with younger people being more likely to be members of both publics. Contrary to our expectations, age does not seem to affect the probability of a person being a member of the action-wary. However, in line with our expectations, older people have a higher probability of being deniers than younger people.

[Figure 2 about here]

⁵ The predicted probabilities were calculated using marginal standardisation rather than holding the other variables in the model at their means. This method has been shown to produce more accurate results for non-linear models (Muller and MacLehose, 2014). Confidence intervals were obtained by non-parametric bootstrapping.

The link between left-right political orientation and latent class membership (figure 2) is as expected. Left wing voters are more likely to be members of the highly and moderately engaged than the deniers. Individuals on the far right of the spectrum have a probability close to zero of belonging to the highly engaged, while those on the left have a probability of over 0.4. The action-wary, deniers and uncertain have opposite trends, with members being more likely to have a right than left-wing orientation.

[Figure 3 about here]

Income also shows a statistically significant relationship with latent class membership (figure 3). However, contrary to our expectations, those in lower income categories are more likely to be members of the highly and moderately engaged than the deniers, compared with people on a higher income. To further explore the effect of income, we ran ordinal logistic regression analyses for each of the categorical indicators of climate change opinion separately (the results are presented in section 5 of the supplemental material). These analyses show that, while people on higher incomes are more likely to believe that climate change is happening than people on lower incomes, people on higher incomes see climate change as a less serious issue, and believe that it should be a lower priority for the government than those on lower incomes.

[Figure 4 about here]

Individuals with a tertiary degree are statistically more likely to be members of the highly engaged public, and less likely to be members of the uncertain group than those without a degree (figure 4). Holding a degree does not seem to significantly affect membership of any of the other publics. The ordinal logistic regression presented in section 5 of the supplemental material, which analyses the different dimensions of climate change opinion separately, also suggests that holding a degree tends to be associated with viewing climate change as a high salience issue and supporting government action rather than belief in the existence of climate change.

[Figure 5 about here]

Finally, the multinomial logistic regression reveals that men tend to be more likely than women to be members of the highly engaged (figure 5). Yet, gender does not seem to affect the probability of membership of any of the other publics. Given that women are typically more concerned about climate change (Clements, 2012; McCright and Dunlap, 2011), this is a somewhat surprising result. The results of the ordinal logistic regression (see section 5 in the supplemental material) indicate that women

(compared with men) tend to view climate change as less serious, and also feel less informed about climate change.

Overall, our analysis shows that the latent classes defined in the previous section can be thought of as genuine publics whose members not only tend to have similar views on climate change, but also share sociopolitical characteristics. They also tend to be of similar age, and place themselves at similar positions on the left-right political spectrum. Despite having much in common in their views on climate change, the moderately engaged and action-wary have quite different sociopolitical characteristics: the moderately engaged are left-leaning while the action-wary are right-leaning. The sociopolitical differences between the publics also add support to the selection of a five class model, as opposed to the three or four class models in which the moderately engaged and action-wary would not have been defined as separate classes. Finally, our results indicate that the uncertain can be considered a coherent 'public', rather than simply a collection of individuals, as members have similar views on many measures, and have some sociopolitical similarities.

Discussion and Conclusion

The aim of our study was to provide a detailed understanding of public opinion about climate change by using a person-centred approach to identify different 'publics'. We investigated three dimensions of climate change opinion: belief in and concern about climate change, issue salience and support for government action. Our results demonstrate that incorporating multiple dimensions when analysing opinion on climate change creates a detailed and precise picture of what people think about climate change and how it might be addressed. This picture suggests that – in the UK context at least – deniers are only a small section of society. As younger and left-wing people were over-represented in the sample used in our study, the size of the denier public may be somewhat larger than reported here: other studies place denial of climate change in the UK between 10 and 12% (Steentjes et al., 2017; Tranter and Booth, 2015). Yet, the attention paid to climate change denial – in both the popular and academic literature – appears to be out of proportion given the current size of the denier public. Moreover, those who have a strong belief that climate change is happening have a diverse range of views that can be better captured by use of a person-centred approach.

The majority of the UK population seems to fit into either the ‘moderately engaged’ or ‘action-wary’ publics, both of which are certain in their belief that climate change is occurring, but differ in their degree of support for government action on climate change. Which one of these publics an individual is a member of appears to be related to their political orientation: left-wing people tend to be moderately engaged, while right-wing people tend to be action-wary. The moderately engaged and action-wary have similar climate views to the highly engaged, with the main difference being that they see climate change as low or medium salience, whereas the highly engaged believe it to be high salience. Given the large sizes of the moderately engaged and action-wary in the UK, the beliefs of these publics is an area that future research could pay more attention to.

Like the ‘Six Americas’ study (Leiserowitz et al., 2009), the publics that we identified can be ordered from the most to least engaged with climate change with respect to almost all the indicator variables. This is different from the initial model that we proposed, where we expected some members of a ‘non-interventionist’ public to feel that climate change is a high salience issue, but to prefer to address it through non-governmental action rather than governmental action such as paying higher taxes. Instead, it appears that most people in the action-wary public acknowledge that government policy is the appropriate way to address climate change. This suggests that ‘hard’ ideological opposition to government action on climate change is not particularly prevalent in the UK, and any hesitancy about government action is a relatively ‘soft’ concern, perhaps related to seeing other (policy) issues as more important.

Of the sociopolitical variables we considered, age and left-right political orientation have the clearest relationship to membership of the publics. The fact that older people are more likely to be deniers, while younger people are more likely to be highly or moderately engaged suggests that post-material values – which are more commonly found among younger people (Moors, 2003) – are influencing climate change views. Additionally, the effect of age on membership of the publics could be explained by the lower levels of environmental concern (which is linked to climate change scepticism) among older people (Whitmarsh, 2011), as well as a preference for maintaining existing social structures which older people are typically more a part of than younger people (Jylhä and Akrami, 2015; Poortinga et al., 2019).

Those on the left are significantly more likely to be highly engaged than those on the right, while members of the action-wary, uncertain and deniers tend to be mostly right wing. However, party preference did not seem to relate to membership of the publics, suggesting that the relationship between political orientation and climate change views is not about partisanship – as it may be in the US (Bolsen and Druckman, 2018; van der Linden, 2017) – but is rather related to people’s wider environmental values. It is likely that individuals on the right engage in motivated reasoning to deny or doubt climate science, the implications of which threaten their individualistic world views (Kahan, 2016; Kahan et al., 2012).

Our analyses also revealed that education, gender and income are related to membership of the publics. We find support for previous research on the link between education and climate change opinion, with people who possess a degree having a higher probability of being a member of the highly engaged, and a lower probability of being a member of the uncertain public, compared with those without a degree. Gender and income relate to membership of the publics in ways that were unexpected given the results of previous research. Men having a higher probability of being members of the highly engaged public compared with women appears to be due to women tending to view climate change as less serious and feeling less informed about it, compared with men. Similarly, those on a higher income are less likely to be members of the highly or moderately engaged than those on a lower income. While there is little difference in belief in climate change among income categories, people on higher incomes tend to be more hesitant to back government action on climate change than those on lower incomes.

Our results therefore underline the importance of considering multiple dimensions of climate change opinion (rather than just belief and concern), as the relationship between sociopolitical measures and the different dimensions of climate change views may be complex. This complexity may help to explain the inconsistent results of previous studies investigating the relationship between climate change views and various sociopolitical variables (Hornsey et al., 2016; van der Linden, 2017). Moreover, our use of both person-centred and variable-centred analyses (which Laursen and Hoff (2006: 383) argue are ‘complementary rather than competing approaches’) allow us to understand the complexity of the relationship between climate

change views and sociopolitical variables, and to illustrate how the sociopolitical covariates relate to the climate change publics in the UK.

More broadly, the characterisation of the publics in terms of both climate change opinion and sociopolitical covariates illustrates the value of using a person-centred approach to investigate climate change views. In particular, a person-centred approach allows us to move beyond the believer-sceptic dichotomy adopted by many previous studies on climate change opinion (Corry and Jørgensen, 2015). As our results demonstrate, there are many differences among climate change ‘believers’, with respect to both salience and support for government action. Additionally, a person-centred approach allowed us to reveal the variation in the relationships between the sociopolitical covariates and climate change views across different sections of the population (Laursen and Hoff, 2006).

One criticism that may be raised against the validity of the findings presented in this study is our reliance on a non-probability sample. While sample weights were employed in our analyses, this is unlikely to have removed all of the bias. Caution is therefore required for generalising the relative sizes of the publics. This is particularly so for the deniers, due to older and right-leaning people – who tend to be more likely to deny the existence of climate change – being under-represented in the sample. Despite this, the prevalences do give us a broad indication of the sizes of the publics, which is confirmed by the fact that they are comparable to similar previous research (Leiserowitz et al., 2009; Steentjes et al., 2017). Moreover, given that sample weights did not substantially affect the results of our analyses and that the main viewpoints on climate change in the UK are likely to be captured in this sample (and, thus, the latent class model), we believe that the results present an accurate picture of public opinion on climate change in the UK. As a person-centred analysis of climate change opinion has not been previously conducted in the UK, future research using a probability sample could help to confirm these results. Such a study could also include a wider range of questions and incorporate other dimensions of climate change views, such as the degree to which people engage in individual actions (for example, limiting personal emissions or engaging in political activism) to help address climate change.

With respect to the wider question of whether public opinion plays a role in the inadequate climate change policy adopted in many countries, this paper can only offer an initial answer with reference to the concept of public will. As noted by Raile et al.

(2014), politicians do not necessarily respond to the preferences of the majority of the public when selecting policies. Other aspects of public opinion, such as people's resolve to address the issue (or issue salience), are also important. A small public with a high degree of resolve – such as the highly engaged – may be able to influence policy, and this appears to have been a factor in the UK adopting the robust policy framework of the Climate Change Act 2008 (Carter and Childs, 2018). However, given what is known about the role of salience in the extent to which policy-makers respond to public opinion (Burstein, 2003), caution is warranted. While the UK has made better progress than most, there is the perception among some experts that this progress is fragile (Fankhauser et al., 2018), and further progress could easily be stalled in the face of other political crises that may arise.

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